Submit to: AS11

International Symposium on Astronomical Telescopes and Instrumentation
Session on Radio Telescopes
Chair: Harvey R. Butcher

Abstract Title: Architecture of the FIRST Telescope

Authors: Eri Cohen, JPL; Steve Connell, COI; Kelly Dodson, COI; Zvi Friedman, COI; and Shaun Whitmore, COI
Please address all correspondence to Eri Cohen, M/S 306-451, Jet Propulsion Laboratory, Pasadena, CA 91109. Telephone (818) 354-0086, fax (818) 393-6869, Eri.J.Cohen@jpl.nasa.gov

Presentation: Oral Presentation

Abstract: The Far Infrared and Submillimeter Telescope (FIRST), is an ESA cornerstone mission, that will be used for photometry, imaging and spectroscopy in the 80 to 670 μm range. NASA, through JPL, will be contributing the telescope and its design to ESA. This paper will discuss the work being done by the Jet Propulsion Laboratory (JPL) and Composite Optics, Incorporated (COI).

Optical and mechanical constraints for the telescope have been defined by ESA and evolved from their trade studies. Design drivers are wave front error (10-μm rms with a goal of 6-μm rms), mass (260 kg), primary mirror diameter (3.5 m) and focal length (f/0.5), and the operational temperature (less than 90 K). In response to these requirements a low mass, low coefficient of thermal expansion telescope has been designed using carbon fiber reinforced plastic (CFRP).

This paper will first present background on the JPL/COI CFRP mirror development efforts. After selection of the material, the next two steps that are being done in parallel are to demonstrate that a large CFRP mirror would meet the requirements and to detail the optical, thermal and mechanical design of the telescope.

The mirror program focused on building a large mirror whose design could be scaled to the final 3.5 diameter mirror size and would meet all mirror requirements. For this purpose a 2-m spherical mirror was fabricated and tested to 70 K. Other mirror demonstrations that focus on particular problems will also be presented.

Key Words: Telescope, Composites, Submillimeter.